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I am not competent to defend the Realists, for I confess I find it difficult quite to assimilate their position; but I suspect they also would have some objections to raise to Professor Watson's interpretation. Certainly the criticism that Realism tends to solipsism might sound more formidable, were it not that, in the present state of disagreement in epistemology, this is an objection which is brought against every theory in turn, including Professor Watson's own theory of Idealism.

My chief ground for fault-finding, then, is this ignoring of some of the most fundamental difficulties that have been brought against the traditional idealistic epistemology, and the assumption that it affords a safe and settled standard, failure to agree with which sufficiently condemns any rival theory. For example, the psychology of knowledge, — the existence of individual thinkers with relatively impervious experiences, and the connection of knowing with such thinkers, — is not a mere arbitrary figment of the philosopher's imagination. Interpreted in some fashion or other, it represents an obvious and unescapable fact, which has to be looked in the face by any adequate epistemology. Professor Watson, so far as I can see, makes no attempt to meet the demand that we be shown just what we are to do with this. There is the familiar oscillation back and forth between what, — no matter how the name of psychology be abjured, — is plainly our human and individual experience, and the absolute experience which transcends us; but how we are to get from the first to the second, and what the concrete experiential relationship is between the two, supposing we have got them both, is once again slurred over. In a new philosophy such gaps might be excusable; but Speculative Idealism has been long enough in the field now to be held accountable. If its God be nothing but the hypostasizing of the abstract laws of intelligence, obtained always from the individual philosopher's examination of his own personal experience, — and I confess that is the best understanding I can get of it finally, — the failure of any satisfactory answer to the demand is easily explained.

A. K. ROGERS.

BUTLER COLLEGE.

Philosophische Voraussetzungen der exakten Naturwissenschaften.

Von ERICH BECHER. Leipzig, J. A. Barth, 1907.— pp. vii, 244.

This work, which is a well-conceived study of an important subject, falls conveniently into three parts, of which the first (Chaps. I and II) deals with the meaning and value of hypotheses, the second (Chaps. III–VI), with the grounding of our hypothesis of an 'outer world,'

and the third (Chaps. VII-IX), with our motives for attributing to this world a certain mechanical constitution. Of these, the third part is a little work of art. With great skill of illustration the author gathers around historic assumptions respecting the structure ("discontinuity of matter") and the laws of behavior ("Kinetic-elastic and Kinetic-electric Images") such an analysis of evidence as would enable us in their reference to distinguish between 'hypothesis' and 'fiction.' By this part of the subject, the present reflections have been chiefly inspired.

Meanwhile, the second division appears to be less deserving. It is also occupied with the issue between 'hypothesis' and 'fiction'; but now *à propos* of the assumption of an 'external world' of bodies in space and time. An effort is made to bring the 'evidence' which saves the assumption of such a world from being a mere fiction in line with the inductive evidence on which hypotheses of a less fundamental nature are based. The author has chosen this occasion for an analysis of the presuppositions (*Voraussetzungen*) from which alone induction can proceed. These presuppositions he takes to be the following:

(1) "Jedem menschen ist das ihm momentare gegebene, d. h. Bewusste, unbedingt gewiss" (p. 59); (2) "Die axiome (der Logik) sind denknotwendig gewiss" (p. 60); (3) "Das vergangene die Erinnerung zwinklässt, und diese als Repräsentation des Vergangenen erkennbar ist" (p. 65); (4) "Die beobachteten Regelmässigkeiten in meinem Bewusstseinsinhalten, die ich aus dem gegenwärtig gegebenen und der Erinnerungsdeutung kenne, auch gelten über dies gebiet hinaus, für das ganze Gebiet meines vergangenen und zukünftigen Bewusstseins" (p. 73). From these postulates we proceed *by induction* to the acceptance, first, of other minds, then, of bodies in space and time. As to the stuff composing the outer world thus constructed, the author is explicit enough. "Wir halten fest dass eine Aussenwelt existiert, und dass ihre Existenz im Qualität-Sein besteht, Qualität in dem Sinne, in dem wir die gegebenen Bewusstseinsinhalte Qualitäten zu heissen pflegen" (p. 134).

If this portion of our author's work was greeted with less enthusiasm than the preceding, it is because the author, though following an oft-tested road, seems scarcely to have given heed to the warnings of history respecting its pitfalls. Criticism has pointed out that, in the matter of such presuppositions, the difficulty lies not so much in getting a world out of them as in putting a meaning into them, — a meaning, that is, which does not presuppose the construction of a world to have been already made. To be sure, a circle may not be wholly

vicious, but the interest of the philosopher can be caught only by one who makes some effort to point out circular virtues that will pass muster before a scrupulous conscience. In general, the status of presuppositions in empirical method is matter for the nicest reflection. They are not meant to be 'fictions,' obviously, and they cannot be 'hypotheses,' whose definition, as we shall see, requires them to be verifiable by the very method whose presuppositions are in question. How such presuppositions are possible, is a question that has not lost its meaning since Kant's day, and still insists on an answer. We have thus worked backward through examples of situations in which the author conceives the disjunction, 'fiction' or 'hypothesis,' to arise, to the question, What does this disjunction mean? This is the problem of the first two chapters of the work before us.

Here we start with the following distinction: "Das wissenschaftliche Denken kann 1. Annahmen machen, von denen es voraussetzt dass sie unzutreffend sind in allen oder einzelnen Punkten, oder 2. Annahmen die es für wahrscheinlich oder gar wahr hält, wenigstens in einzelnen Theilen" (p. 11).

The first class of assumptions are 'fictions.' Among them the author would include (1) mere 'simplifications,' like the concepts of material point, frictionless motion, ideal gas, isolated magnetic pole; (2) graphic models, like the many that have been constructed to demonstrate the properties of the ether. For the fiction thus defined the author claims a high utility, and, in spite of its "partial or entire" incorrectness, a place among the indispensable apparatus of science.

It is to be regretted that the author does not enter at greater length into a question that has puzzled many thinkers: How, namely, can a partial or complete falsehood be useful or indispensable to a science pretending to an insight into truth? Too much capital has been made of the 'indispensably fictitious' character of scientific construction to allow us longer to content ourselves with such expressions as 'simplicity' and 'convenience.'

But more important to the internal consistency of the work before us is the reflection that, if fictions contain a recognized element of falsehood, the disjunction 'fiction' or 'hypothesis' is no longer complete enough for the classification of the historic assumptions of science. We have already seen that the 'presuppositions' of inductive method would fall into neither class. But, what is more important to the author's purpose, the assumptions of an atomic structure, of an ether-medium, are not regarded by those who deny their scientific

value as partially false assumptions ; but merely as going an *unnecessary length* beyond the facts. For the critics of such hypotheses, the use of such unnecessary apparatus is a sign of that infirmity of mind which, in Ostwald's phrase, calls for a 'crutch.'

The point is perhaps most clearly brought out in the history of the attempt to determine the 'atomic masses' of the chemical elements. If one is averse to the use of a crutch, one may still retain the historic term 'atom' in some such use as that of Laurent (*Chemical Method*, 1853). "By the term 'atoms,' I understand the equivalents of Gerhardt, or, what comes to the same thing, the atoms of Berzelius." Or again: "In order to avoid all hypotheses, I shall not attach to the term 'atom' any other sense than that which is included by the term 'proportional number.'" Now the methods by which these 'proportional numbers' were originally assigned, made use only of the mass-ratios in which elements combine. But this method would not enable us to assign a unique 'proportional number' to a given element ; it would leave on our hands a series of numbers standing in the relation of submultiple to multiple.

How remove this ambiguity? One way of doing so is to make use of Avogadro's Law. This law was conceived and originally formulated in terms of assumed discontinuity of structure in gases. It introduced the concept of the molecule, and, historically, the motives for employing it as a means of choosing one of a series of 'proportional numbers' left on our hands by a comparison of masses were bound up with the conception of an equal number of molecules in equal volumes of gases under certain identical conditions. But, naturally, in practice one does not *count* the molecules ; and it would be perfectly possible to describe the procedure by which determinations of volume are combined with considerations of mass to determine 'proportional numbers' without so much as mentioning the terms 'molecule' and 'atom.' This procedure would, to be sure, appear perfectly arbitrary, if no other facts were known than those of quantitative analysis and the weights of equal volumes of gases. But, with increasing knowledge of the physical and chemical behavior of substances, a motive for the procedure can be assigned which does not reintroduce the assumption of a molecular structure. We may, namely, say that we shall select from among the series of proportional numbers that one which will give to the element such place in the array of elements as will render its behavior most conformable with the Periodic Law. The uniformity to which this law gives expression is sufficient simplification of our thought to furnish a motive for preserving it when possible,

and contains fewer unproved assumptions than does a theory of discontinuity of structure. It is therefore scientifically imposed upon us, and any use of a structural-image must be regarded as a merely personal choice of thought apparatus.

The issue here is not between 'hypothesis' and 'fiction,' as our author has defined his terms, but between compulsory hypothesis and purely permissible hypothesis. But this issue is really a vital one. If the atomic-theory is to be defended, it must be shown that it is compulsory; and to show that it is compulsory, one must do more than point out that certain analogies do not break down. One must make it clear that by its means an economy is introduced into our thinking greater than that permitted by the broadest generalization effected without it.

Now this greater economy introduced with the concept of discontinuity of structure may, the present writer feels, be demonstrated. If one compare the situation of a science whose last generalization is the Periodic Law (idealized, if you will, to the point of making the properties of elements an exact function of 'proportional numbers') with the situation of a science expressed in terms of such spatial discontinuities as contemplated by the corpuscular theory (in the form, *e. g.*, presented by J. J. Thomson), one realizes that the economy effected by the assumption of discontinuity (whether of masses, of charges, or of both) affects the 'dimensions' of our final image of nature. One may express the 'ideal' that has controlled the development of science in a simple way. It has been, first, to arrive at such an insight as would enable us to predict the future behavior of a system, given the conditions *a, b, c*, at each point in space at a moment of time, and, second, to reduce the numbers of these independent conditions (we have hence called them 'dimensions') to a minimum. It is to effect such a reduction of the number of dimensions that theories of concealed discontinuities have always been invoked. Success has always been dependent upon the construction of one of a number of dimensions out of others of that number. For example, to express temperature as a function of velocities is to eliminate temperature as a dimension of our image of nature. To construct atoms out of corpuscles is to eliminate atomic mass as a dimension, one which the Periodic Law retains.

In a word, then, the assumption of discontinuity of structure is forced upon us, in the present state of our knowledge, not by the increased power of prediction with which it provides us, but by the simplicity of the apparatus of prediction which it makes possible. And this sim-

plicity is not gained by a 'neglect,' by an 'abstraction' from a recognized element of falsity, but by a reduction of the independent variables which are required for our description of nature. The alternative does not lie between hypothesis and fiction; but between a simple hypothesis and a cumbersome group of hypotheses.

It would have been a pleasure in this connection to follow the author in his brief discussion of the ether-hypothesis. The present writer shares his feeling that the motives which inspire most physicists to accept this assumption are insufficient. The economy effected by the assumption is far from clearly demonstrable. But the problem is a delicate one and not susceptible of a brief discussion. The writer, and he thinks many others, would welcome a more complete analysis of the assumption from a pen equipped as is our author's with a technical information that would render an opinion competent.

EDGAR A. SINGER, JR.

UNIVERSITY OF PENNSYLVANIA.

Schopenhauer und Nietzsche. Ein Vortragszyklus. Von GEORG SIMMEL. Leipzig, Duncker & Humblot, 1907. — pp. xii, 263.

This book is not an attempt to give a complete and systematic reproduction of the philosophies of Schopenhauer and Nietzsche. That would be but a waste of time in the case of Schopenhauer, for he has himself stated his philosophy with such transparent clearness and logical directness; and in the case of Nietzsche it would be impossible, for his poetic and impassioned utterances, when reduced to cold logical propositions, lose their distinctive meaning and may be interpreted in the interests of diverse philosophies. So what the author proposes is to give a philosophical study of the philosophers themselves. He would strike right through to what is central in their thinking, holding that what is objectively most valuable in their work is to be found precisely in the few leading motives that inspired it. Viewing the philosophers in this light, their brilliant paradoxes, their eccentricities can for the most part be ignored. They are but barbaric ornaments of style, or else weapons employed in offensive and defensive warfare with opposed views, and have, in the main, but an occasional significance.

In seeking to portray this central core of doctrine, the author allows himself the liberties of the portrait painter. History deals with her great men much as the artist does with the subject whose portrait he is painting, selecting this feature for emphasis, ignoring that, and giving the picture a unity of character which no mere photographic